PATENT ABSTRACTS OF JAPAN

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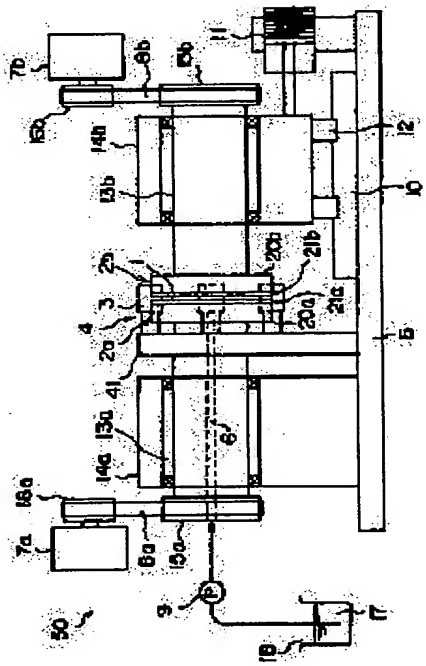
))Priority
iority number : 11136919 Priority date : 18.05.1999 Priority country : JP

4) BOTH SURFACE POLISHING DEVICE AND METHOD

7)Abstract:
ROBLEM TO BE SOLVED: To increase a polishing speed and grind the ıole of the surface of a glass disc with an uniform margin by a method ıerein both surfaces of a glass disc further increased in thickness are nultaneously polished and a polishing method is made suitable for the ıss disc for a magnetic recording medium.
)LUTION: The both surfaces of the surface and the back of a glass disc ving an outer periphery with a diameter D1 of 65 mm and an inner riphery with a diameter D2 of 20 mm are pressed in a nipped state ainst a pair of rotary polishing bodies 2a and 2b for simultaneous lishing. In a polishing method described above, the glass disc is held by a rtical attitude holding means 4 and the glass disc is forcibly rotated, and lishing is executed by using a rotary polishing body with a diameter D of, example, 70 mm (having a relation of D>D1-D2) having a rotary axis ralleling the rotary axis of the glass disc, the rotary polishing device rving as a pair of the rotary polishing bodies 2a and 2b.



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AIMS

ıim(s)]
ıim 1] Front flesh-side both sides of the ground disk which has the periphery of a diameter D1, and the inner umference of a diameter D2 While being the double-sided polish approach of the ground disk which sandwiches and nuates with the barrel-polishing object of a pair which was made to counter both sides of said ground disk, and was ıblished, and is ground to coincidence, and holding said ground disk with a vertical posture maintenance means and ʏying out forcible rotation The double-sided polish approach of the ground disk characterized by the revolving-shaft ɲment using the barrel-polishing object of said pair as the barrel-polishing object of the diameter D (D>D1-D2) ch has a revolving-shaft alignment parallel to the revolving-shaft alignment of said ground disk.
ıim 2] The double-sided polish approach of the ground disk according to claim 1 characterized by making the ıpulsive rotational frequency of said ground disk larger than the rotational frequency of the barrel-polishing object of l pair.
ıim 3] The double-sided polish approach of the ground disk according to claim 1 or 2 characterized by having ınged the revolving-shaft alignment of the barrel-polishing object of said pair on the outside of the periphery of said und disk.
aim 4] A means to hold the ground disk which has the periphery of a diameter D1, and the inner circumference of a meter D2 into a vertical posture, The means which carries out forcible rotation of said ground disk, and the barrel-ishing object of the pair which is arranged so that it may face across both sides of said ground disk, and has a olving-shaft alignment parallel to the revolving-shaft alignment of said ground disk, A means to show at least one ɜ of the barrel-polishing object of said pair to spite said ground disk, Double-sided polish equipment which it is ıble-sided polish equipment which has the rotation drive of the barrel-polishing object of said pair, and the diameter ›f the barrel-polishing object of said pair is D>D1-D2, and is characterized by arranging those revolving-shaft ɡnments on the outside of the periphery of said ground disk.

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TAILED DESCRIPTION

:tailed Description of the Invention]
01]
eld of the Invention] This invention relates disks, such as a metal, ceramics, and glass, to grinding, the approach of ıding, and its equipment at coincidence using the barrel-polishing object of a pair. This invention especially relates to suitable polish approach for the glass disk and aluminum disk which are used for a magnetic-recording medium, and ish equipment.
02]
:scription of the Prior Art] As an approach of grinding front flesh-side both sides of a glass disk to coincidence erting a glass disk with the barrel-polishing object of the pair which holds a glass disk into a vertical posture with the ıtion roller of the shape of three cylinder, and has a diameter smaller than the diameter of the glass disk in JP,6-)560,A While rotating a barrel-polishing object, it is made to reciprocate to the circumference of the revolving-shaft ınment in alignment with the axial center of a glass disk, and the approach and equipment which grind front flesh-ɜ both sides of a glass disk to coincidence are indicated.
03] Moreover, as it is made not to carry out the neck swing of one side to JP,61-10275,B to the revolving shaft of a rel-polishing object among the barrel-polishing objects of a pair and the neck swing of another side is carried out to it he revolving-shaft alignment of a barrel-polishing object with a universal joint, the approach and equipment which ıd front flesh-side both sides of the ground body are indicated, and it is [0004].
oblem(s) to be Solved by the Invention] By the approach indicated by JP,6-210560,A, since the diameter of a barrel-ishing object is smaller than the diameter of the ground body, and in order to make a barrel-polishing object iprocate to the circumference of the revolving-shaft alignment in alignment with the axial center of a ground disk and ɡrind it, the size of a polish rate arose by the location of a ground disk, and the technical problem that it was difficult :arry out polish processing of the whole field of a ground disk uniformly at a high speed occurred.
)05] Moreover, by the approach indicated by JP,61-10275,B, one side of a barrel-polishing object is held by ****, l about another side, since the ground body is ground for the barrel-polishing object as a neck swing device to a olving-shaft alignment with the universal joint, distribution of the pressure concerning the ground body does not :ome homogeneity. For this reason, the technical problem that it is difficult to grind the whole field to the ground ly to homogeneity occurs. Furthermore, in order that the ground body might carry out flattery rotation with a barrel-ishing object, the technical problem which should be solved practically that a polish rate was low occurred.
)06]
eans for Solving the Problem] The double-sided polish approach of this invention made in order to solve the above-ntioned technical problem Front flesh-side both sides of the ground disk which has the periphery of a diameter D1, l the inner circumference of a diameter D2 While being the double-sided polish approach of the ground disk which ıdwiches and insinuates with the barrel-polishing object of a pair which was made to counter both sides of said)und disk, and was established, and is ground to coincidence, and holding said ground disk with a vertical posture intenance means and carrying out forcible rotation It is the double-sided polish approach of the ground disk ıracterized by the revolving-shaft alignment using the barrel-polishing object of said pair as the barrel-polishing ect of the diameter D (D>D1-D2) which has a revolving-shaft alignment parallel to the revolving-shaft alignment of d ground disk.
)07] It is a large polish rate to make it larger than the rotational frequency of the barrel-polishing object of a pair, and compulsive rotational frequency of a ground disk has it, when grinding by uniform thickness over the whole ground k. [desirable]
)08] Moreover, the revolving-shaft alignment of the barrel-polishing object of a pair is desirable when arranging on

outside of the periphery of a ground di[redacted]grinds by uniform thickness over the w[redacted]e ground disk.
09] A means to hold the ground disk by which the polish equipment of this invention has the periphery of a diameter and the inner circumference of a diameter D2 into a vertical posture, The means which carries out forcible rotation aid ground disk, and the barrel-polishing object of the pair which is arranged so that it may face across both sides of l ground disk, and has a revolving-shaft alignment parallel to the revolving-shaft alignment of said ground disk, A ans to show at least one side of the barrel-polishing object of said pair to spite said ground disk, It is double-sided ish equipment which has the rotation drive of the barrel-polishing object of said pair, and the diameter D of the rel-polishing object of said pair is D>D1-D2, and it is characterized by arranging those revolving-shaft alignments on outside of the periphery of said ground disk.
10]
abodiment of the Invention] The gestalt of operation of this invention is explained based on drawing 1 - drawing 4 ow. Drawing 1 is the general drawing of one example of the double-sided polish equipment of this invention. The ible-sided polish equipment 50 of this invention contains barrel-polishing object 2a arranged at a stand 5, a vertical ture maintenance means 4 to hold the ground disk 1 arranged in the center section of this stand 5 into a vertical ture, and the both sides of this attaching part 4, and 2b.
11] Barrel-polishing object 2a of a pair and 2b are arranged on the stand 5 so that it may face across both sides of the und disk 1 held with the roller 3 at the vertical posture, and the revolving-shaft alignment may become the revolving- ft alignment of the ground disk 1, and parallel.
12] Barrel-polishing object 2a is being fixed to revolving-shaft barrel 13a supported pivotable by bearing object 14a ed to the stand 5. Rotation of electric motor 7a fixed by support (not shown) is told to barrel-polishing object 2a ough belt 8a which connects pulley 15a attached in the edge of pulley 16a attached in the revolving shaft of an ctrical motor, and pulley 16a and revolving-shaft barrel 13a. In the revolving shaft of revolving-shaft barrel 13a and ley 15a, the polish liquid feed holes 6 for supplying the polish liquid 17 in a storage tank 18 to the interior of barrel- ishing object 2a with the transportation pump 9 are formed.
13] Barrel-polishing object 2b is being fixed to revolving-shaft barrel 13b currently supported pivotable by bearing ect 14b supported by the slider section 12 which moves while sliding on the rail 10 top prepared in the stand 5 at a gitudinal direction. Rotation of electrical-motor 7b is told to barrel-polishing object 2b through belt 8b which nects pulley 16b attached in the edge of pulley 16b attached in the revolving shaft of an electrical motor, and pulley) and revolving-shaft barrel 13b.
14] A means to show at least one side of barrel-polishing object 2a of a pair and 2b to spite the ground disk 1 is ablished. This insinuating remark means will not be limited especially if it has the function which presses the barrel- ishing object 2 against the polished surface of the ground disk 1 by the predetermined pressure. In drawing 1 , the ler section 12 supporting the bearing object 14, the rail 10 which makes the slider section 12 slide to a longitudinal ection, and the thing which consists of press equipment 11 which has a pneumatic cylinder are shown. Approach and enation of barrel-polishing object 2b are enabled by motorised [of press equipment 11] at the ground disk 1, and it is inuated by the ground disk 1 by the suitable pressure by it.
15] In drawing 1 , barrel-polishing object 2a is fixed to a longitudinal direction, and barrel-polishing object 2b is own to spite a longitudinal direction, and is movable by the means. The ground disk 1 is insinuated in the state of ss with the barrel-polishing object 2 which the pair is rotating, polish liquid is supplied in the state of this press, and a nding process and polish processing are performed. The ground disk 1 is inserted into the peripheral face with at least ee rollers, and the vertical posture maintenance means 4 of the ground disk 1 is held.
16] Drawing 2 is drawing showing the gestalt of 1 operation of the vertical posture maintenance means 4 of the und disk 1 of the double-sided polish equipment of this invention, and the motor 19 for compulsive rotation. The dition of being held by roller 3d which carries out forcible rotation of Rollers 3a, 3b, and 3c and one ground disk ich were attached in drawing 2 (a) free [three rotations] is shown. The dimension of the thickness (direction rpendicular to space) of each roller 3 is fully larger than the dimension of the thickness of the ground disk 1. The slot larger width of face a little than the thickness of the ground disk 1 may be established in the peripheral face of each ler 3 in order to make easy installation of removal from the maintenance means of the ground disk 1, or a intenance means. Through the migration metallic ornaments 43 attached movable as slid on the rib 42 along the die- igth direction, the rollers 3a and 3c of two tops are supported so that the revolving-shaft alignment of each roller may come level with dummy support 44. The lower rollers 3b and 3d are attached in the stanchion 41.
17] The gestalt of 1 operation of the means which carries out forcible rotation of the ground disk 1 of this invention shown in drawing 2 (b). A roller 3d shaft is connected with the motor 19 for compulsive rotation, and forcible rotation carried out by rotation of roller 3d at a predetermined rotational frequency. Compulsive rotation of the ground disk 1

erformed by the motor for compulsive rotation attached in at least one roller.
18] Drawing 3 is drawing for explaining the physical relationship of the revolving-shaft alignment of the ground disk hich has the diameter D2 of inner circumference and the diameter D1 of a periphery concerning this invention, and barrel-polishing object 2. The condition that the ground disk 1 was inserted into the peripheral face of three rollers 3b, and 3c by the peripheral face, and was held at the vertical posture is shown in drawing 3 . The revolving-shaft gnment of one barrel-polishing object 2a is set to D>D1-D2, when it can be moved in parallel with the revolving-ft alignment of the ground disk 1, and can be made into what can adjust distance a and the diameter of barrel-ishing object 2a is set to D.
19] What stuck the scouring pad on metal or the surface plate made from the ceramics, and the thing which stuck the mond wheel of predetermined grain size on the front face of a surface plate can be used for the barrel-polishing ect 2 used for this invention. Drawing 4 (a) and drawing 4 (b) are the top views and sectional views of a gestalt of a rel-polishing object which can be used for this invention. [of one example] In drawing 4 (a), the slot 22 connected h the polish liquid feed holes 6 at one side of the metal disk 20 is established in the radial toward the periphery of a face plate. A slot 22 is good also as the shape of a curled form or a grid etc.
20] The scouring pad 21 made of resin is stuck on the surface plate side. With the polish liquid (supplied from the ow head of drawing 4 (b)) supplied from the polish liquid feed holes 6, it is supplied on the slot made by sticking it it as a scouring pad 21 learns from the front face of the slot processed on the front face of a surface plate 20. A uring pad 21 may be stuck to slot 22 inside of a surface plate, and it is not necessary to necessarily stick it, and it y be stuck in the condition that a clearance is between the slot 22 on the surface plate, and a scouring pad 21.
21] It is because a processing load is not applied to the field of the scouring pad of a slot at the time of polish cessing, so polish liquid is supplied along a slot. When sticking a diamond wheel on a surface plate and considering a barrel-polishing object, it is good for the above slots to be able to be made to do the piece of a diamond wheel to k.
22] The thing which made pure water or alkaline liquid distribute the cerium oxide whose average abrasive grain is micrometers - about 2 micrometers, a diamond abrasive grain, a silicon carbide abrasive grain, an alumina abrasive in, a zirconia abrasive grain, a manganese oxide abrasive grain, an iron-oxide abrasive grain, etc. as an abrasive terial used for implementation of the polish approach of this invention, and the colloidal silica whose mean particle meter is 0.02 micrometers - about 0.2 micrometers can be used. Moreover, bonded abrasive, such as a diamond eel, may be used.
23] As a scouring pad holding the abrasive material of this invention, the thing of the shape of a sheet, such as a pad he suede made from urethane, a pad made from urethane foam, and a pad of a nonwoven fabric, can be used. thermore, you may be a scouring pad with a slot by machining or the heat press.
24] The double-sided polish equipment of this invention of drawing 1 is the gestalt of the 1 operation which supplied ish liquid from the barrel-polishing object 2a side. In the side which is not supplied [that polish liquid is supplied,], a difference does not arise in the amount of machining allowances of a ground disk. The glass disk and aluminum k for magnetic-recording media by which a ground disk is used for a magnetic recording medium (HDD) are used tably.
25] This invention is explained in full detail according to an example below.
e diameter of 65mm and inner circumference performed [the diameter of a periphery] polish processing whose chining allowance is 0.05-10 micrometers using the double-sided polish equipment shown in example 1 drawing 1 ut the glass disk of the shape of a doughnut of 20mm and alumino silicate glass with a thickness of 0.65mm. The cification and polish conditions of the used double-sided polish equipment are as follows.
26] 1) Barrel-polishing object : what stuck the scouring pad (first ball-race incorporated company product name gal 1900) of the suede made from urethane on the surface plate made from stainless steel with a diameter of 70mm. Surface plate : as shown in drawing 4 , six slots whose cross sections with a width of face [of 5mm] and a depth of mm are R configurations were prepared.
From the polish liquid feed holes prepared in one revolving-shaft alignment of a supply:barrel-polishing object ough the slot from the supply axial center of polish liquid, mean particle diameter supplies per minute 3-10ml of ngs which made pure water distribute the cerium oxide which is about 1 micrometer.
number [of a barrel-polishing object] of rotations: -- number [of a 800rpm5 glass disk] of rotations: -- thrust [of a 00rpm6 barrel-polishing object]: -- about 5 kgf(s)7 polish time amount: -- distance [of the center of rotation of 1 nute glass / 8 / disk, and the revolving-shaft alignment of a barrel-polishing object]: -- distance a: from the glass disk ipheral face of the revolving-shaft alignment of 25mm9 barrel-polishing object -- an outside -- 11.5mm [0027] The luation result of polish conditions and polish is collectively shown in Table 1. At this time, the machining-allowance

iation of a glass disk measured about [redacted]places of the glass disk before and behi[redacted]polish. From the example 1 of ›le 1, the distance a from the glass disk periphery of the revolving-shaft alignment of a barrel-polishing object was e to perform polish of 7.2 micrometers of machining allowances by polish rate 7.2 micrometer/min outside at the e of 11.5mm. Moreover, when the machining-allowance variation in the glass disk at this time measured 12 in a ss disk, it turned out that it is 0.1 micrometers or less.

28]

ble 1]

========== Example Polish conditions Evaluation of polish ----------
-------- A glass disk A barrel-polishing object Field of a machining allowance Polish rate Inner variation crometer) (micrometer/min) ---------- Outer-diameter D1/ Compulsive rotation Diameter D volving-shaft alignment Bore D2 A number and rotation D - (D1-D2) Glass circle (mm) Direction (mm) Board iphery ** -- distance a (mm) ---------- (example)
5/20 1000 70 Outside <0.1 7.2 The flattery direction 25 11.52 65/20 500 70 Outside <0.1 3.8 Hard flow 25 7.53
20 1000 70 To an outside <0.1 5.5 Hard flow 25 1.5==========[0029] In mple 2 example 1, the rotational frequency of a glass disk was set to 500rpm at the reverse sense with the direction ich carries out flattery rotation the barrel-polishing object, and the glass disk was similarly ground except having nged the location a from the glass disk periphery of the revolving shaft of a barrel-polishing object into 7.5mm side. A result is shown in Table 1. The distance a from the glass disk periphery of the revolving shaft of a barrel-ishing object was able to perform polish of 3.8 micrometers of machining allowances by polish rate 3.8 :rometer/min outside from the example 2 of Table 1 at the time of 7.5mm. Moreover, when the machining-allowance iation in the glass disk at this time was measured like the example 1, it turned out that it is 0.1 micrometers or less.

30]

ble 2]

========== Example Polish conditions Evaluation of polish ----------
-------- A glass disk A barrel-polishing object Field of a machining allowance Polish rate Inner variation crometer) (micrometer/min) ---------- Outer-diameter D1/ Compulsive rotation Diameter D volving-shaft alignment Bore D2 A number and rotation D - (D1-D2) Glass circle (mm) A direction (mm) board iphery ** -- distance -- a (mm) ---------- Example 1 of a comparison 65/20 It does not carry out. Outside 0.3 3.0 (Flattery rotation) 25 7.52 65/20 It does not Carry out, but is 40. To the inside 1.0 3.0 (flattery ıtion) -5 7.5 ========== [0031] In example 3 example 1, the rotational quency of a glass disk was set to 1000rpm at the reverse sense with the direction which carries out flattery rotation barrel-polishing object, and the glass disk was similarly ground except having changed the distance a from the glass te periphery of the revolving shaft of a barrel-polishing object into 1.5mm outside. A result is shown in Table 1. The tance a from the glass disk periphery of the revolving shaft of a barrel-polishing object was able to perform polish of micrometers of machining allowances by polish rate 5.5 micrometer/min outside from the example 3 of Table 1 at time of 1.5mm. Moreover, when the machining-allowance variation in the glass disk at this time was measured like example 1, it was 0.3 micrometers.

32]

ıble 3]

========== Example Polish conditions Evaluation of polish ----------
-------- A glass disk A barrel-polishing object Field of a machining allowance Polish rate Inner variation icrometer) (micrometer/min) ---------- Outer-diameter D1/ Compulsive rotation Diameter D volving-shaft alignment Bore D2 A number and rotation D - (D1-D2) Glass circle (mm) A direction (mm) board iphery ** -- distance -- a (mm) ---------- Example of comparison 3 (b) 65/20 It does not carry . 70 Outside 0.25 4.5 (Flattery rotation) 25 1.5 (b) 65/20 It does not carry out. 70 Outside 0.2 3.0 (Flattery rotation) 7.5 (Ha) 65/20 It does not carry out. 70 To an outside 1.0 2.3 (flattery rotation) 25
5========== [0033]

ıble 4]

========== Example Polish conditions Evaluation of polish ----------
-------- A glass disk A barrel-polishing object Field of a machining allowance Polish rate Inner variation icrometer) (micrometer/min) ---------- Outer-diameter D1/ Compulsive rotation Diameter D volving-shaft alignment Bore D2 A number and rotation D - (D1-D2) Glass circle (mm) A direction (mm) board iphery ** -- distance -- a (mm) ---------- Example of comparison 4 (b) 65/20 It does not carry . 70 (Flattery rotation) 0.25 4.5 (Flattery rotation) 25 (b)s 65/20 It does not carry out. 70 (flattery rotation) 0.3 4.0

ttery rotation) 25 1.5 (Ha) 65/20 It does not carry out. 70 To an outside 0.5 3.3 (flattery rotation) 25
5========== [0034]
ble 5]
========== Example Polish conditions Evaluation of polish ----------
-------- A glass disk A barrel-polishing object Field of a machining allowance Polish rate Inner variation
crometer) (micrometer/min) ---------- Outer-diameter D1/ Compulsive rotation Diameter D
/olving-shaft alignment Bore D2 A number and rotation D - (D1-D2) Glass circle (mm) A direction (mm) board
iphery ** -- distance -- a (mm) ---------- Example of comparison 5 (b) 65/20 It does not carry
. 70 To the inside 0.36.3 (Flattery rotation) 25 11.5 (b)s 65/20 It does not carry out. 70 Outside 0.3 5.0 (Flattery
ıtion) 25 7.5 (Ha) 65/20 It does not carry out. 70 Outside 0.6 4.3 (flattery rotation) 25 11.5
========== [0035] In example of comparison 1 example 1, the glass disk was
ilarly ground except having depended the rotational frequency of a glass disk on flattery rotation of a barrel-
ishing object, and having set distance a from the glass plate periphery of the revolving-shaft alignment of a barrel-
ishing object to 7.5mm. As a result was shown in Table 2, when the machining-allowance variation within the field
ı glass disk was measured like the example 1, it was 0.3 and the polish rates were 3.0 micrometer/min.
36] In example of comparison 2 example 1, the glass disk was similarly ground except having set the diameter of a
rel-polishing object to 40mm, and having set distance a from the glass disk periphery of the revolving-shaft
gnment to 7.5mm at the inner circumference side, and having made the barrel-polishing object carry out flattery
ıtion of the rotational frequency of a glass disk. As shown in Table 2, polish of 3.0 micrometers of machining
›wances was able to be performed for the result by 3.0 micrometer/min. However, when the machining-allowance
iation of a glass disk was measured like the example 1, it was as big as 1.0 micrometers.
37] the distance a from the glass disk periphery of having not carried out forcible rotation of the glass disk, but
ing considered as flattery rotation in example of comparison 3 example 1, and the revolving-shaft alignment of a
rel-polishing object -- (**) -- 1.5mm and (**) -- except having been referred to as 7.5mm and 11.5 (Ha)mm, it was
de the same and the glass disk was ground. [result / as shown in Table 3 / an example 1], the polish rate was also
/ and the machining-allowance variation of a glass disk also became large.
38] the distance a from the glass plate periphery of the revolving shaft of having carried out flattery rotation of the
ss disk in example of comparison 4 example 2, and a barrel-polishing object -- (**) -11.5mm and (**) -- except
ing been referred to as 1.5mm and 11.5 (Ha)mm, it was made the same and the glass disk was ground. About the
ult, as shown in Table 4, the machining-allowance variation of a glass disk became large.
39] the distance a from having carried out flattery rotation of the glass disk in example of comparison 5 example 3,
l the glass disk periphery of the revolving shaft of a barrel-polishing object -- (**) -11.5mm and (**) -- except having
n referred to as 7.5mm and 11.5 (Ha)mm, it was made the same and the glass disk was ground. About the result, as
›wn in Table 5, the machining-allowance variation of a glass disk became large.
40] As are explained above, and the example and the example of a comparison explained, by carrying out forcible
ation of the glass disk, and locating the location of the revolving-shaft alignment of a barrel-polishing object outside
periphery of a glass disk, and grinding it shows that a big polish rate can be maintained and the polish machining
›wance of a glass disk can be made into homogeneity over the whole surface.
41] Moreover, in order to have carried out the polish machining allowance of a glass disk to homogeneity over the
ole surface, it turned out that it is good to make the radius (polish effective radius) of a barrel-polishing object larger
n the width of face of the direction of a path of a glass disk.
42]
fect of the Invention] It faces according to this invention, inserting and showing with the barrel-polishing object of
pair which front flesh-side both sides of the ground disk which has the periphery of a diameter D1 and the inner
cumference of a diameter D2 were made to counter both sides of a ground disk, and established them to spite, and
nding to coincidence. Since (D1-D2) enlarged more the diameter D of the barrel-polishing object of the pair arranged
that it may have a revolving-shaft alignment parallel to the revolving-shaft alignment of a ground disk while carrying
t forcible rotation of the ground disk which carried out the maintenance means to the vertical posture At a big polish
e, the whole grinder-ed can be ground in uniform thickness.

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AWINGS

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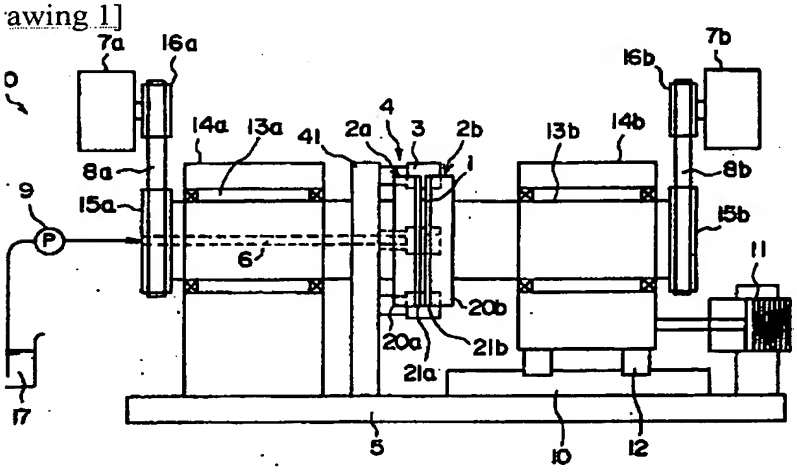

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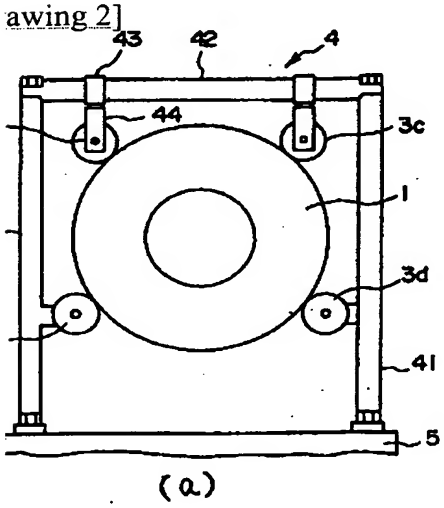

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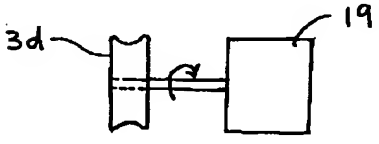

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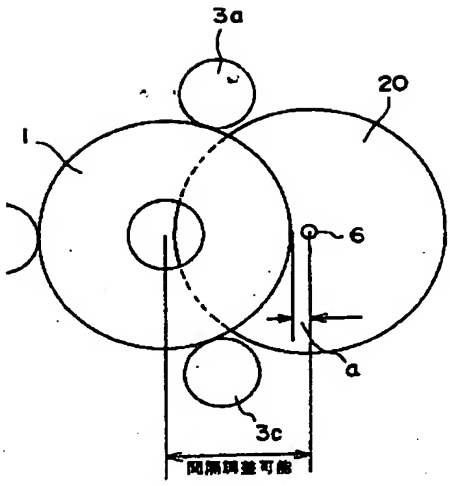
awing 3]



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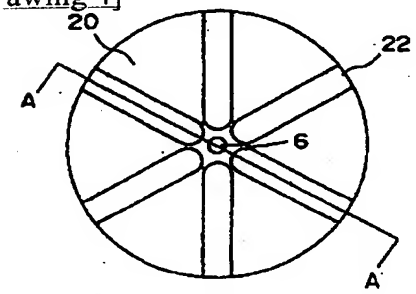
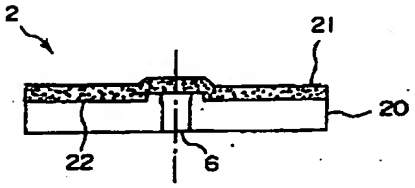


(a)



(b)

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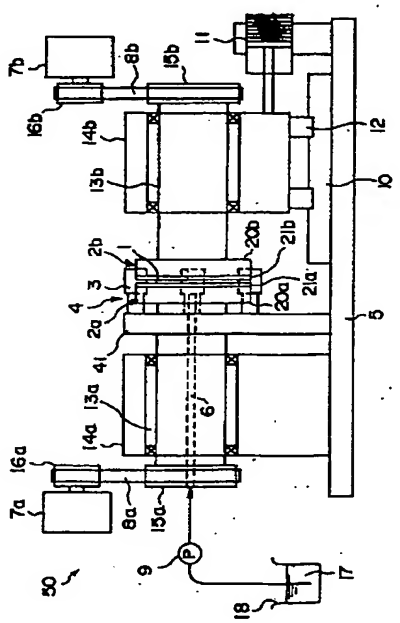
(54)【発明の名称】　両面研磨方法および両面研磨装置

(57)【要約】
【課題】板厚みがより厚いガラス円盤の両面を同時に研磨して、磁気記録媒体用のガラス円盤に適した研磨方法として、研磨速度が大きく、かつガラス円盤の面全体を均一な取代で研磨する方法およびそれに適した両面研磨装置はなかった。
【解決手段】直径Ｄ１（６５ｍｍ）の外周と直径Ｄ２（２０ｍｍ）の内周とを有するガラス円盤の表裏両面を、ガラス円盤の両面に対向して設けた一対の回転研磨体で挟み当てつけて同時に研磨する研磨方法であって、ガラス円盤を縦姿勢保持手段により保持し、かつガラス円盤を強制回転させるとともに、一対の回転研磨体として、その回転軸心がガラス円盤の回転軸心に平行な回転軸心を有する直径Ｄ（たとえば７０ｍｍでＤ＞Ｄ１－Ｄ２の関係を有する）の回転研磨体を用いて研磨する。



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【特許請求の範囲】
【請求項１】直径Ｄ１の外周と直径Ｄ２の内周とを有する被研磨円盤の表裏両面を、前記被研磨円盤の両面に対向させて設けた一対の回転研磨体で挟み当てつけて同時に研磨する被研磨円盤の両面研磨方法であって、
前記被研磨円盤を縦姿勢保持手段により保持し、かつ強制回転させるとともに、前記一対の回転研磨体を、その回転軸心が前記被研磨円盤の回転軸心に平行な回転軸心を有する直径Ｄ（Ｄ＞Ｄ１－Ｄ２）の回転研磨体としたことを特徴とする被研磨円盤の両面研磨方法。
【請求項２】前記被研磨円盤の強制回転数を前記一対の回転研磨体の回転数より大きくしたことを特徴とする請求項１に記載の被研磨円盤の両面研磨方法。
【請求項３】前記一対の回転研磨体の回転軸心を前記被研磨円盤の外周の外側に配置したことを特徴とする請求項１または２に記載の被研磨円盤の両面研磨方法。
【請求項４】直径Ｄ１の外周と直径Ｄ２の内周とを有する被研磨円盤を縦姿勢に保持する手段と、前記被研磨円盤を強制回転する手段と、前記被研磨円盤の両面を挟むように配置され前記被研磨円盤の回転軸心に平行な回転軸心を有する一対の回転研磨体と、前記一対の回転研磨体の少なくとも一方を前記被研磨円盤に当てつける手段と、前記一対の回転研磨体の回転駆動機構とを有する両面研磨装置であって、
前記一対の回転研磨体の直径ＤがＤ＞Ｄ１－Ｄ２であり、かつ、それらの回転軸心が前記被研磨円盤の外周の外側に配置されていることを特徴とする両面研磨装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、金属、セラミックス、ガラス等の円盤を、一対の回転研磨体を用いて同時に研削、研磨する方法およびその装置に関する。とりわけ、本発明は、磁気記録媒体に用いられるガラス円盤やアルミニウム円盤に好適な研磨方法および研磨装置に関する。
【０００２】
【従来の技術】ガラス円盤の表裏両面を同時に研磨する方法としては、特開平６－２１０５６０号公報に、３つの円筒状の回転ローラでガラス円盤を縦姿勢に保持し、そのガラス円盤の直径よりも小さい直径を有する一対の回転研磨体でガラス円盤を挟み付けながら、回転研磨体を回転させるとともに、ガラス円盤の軸心に沿う回転軸心周りに往復運動させて、ガラス円盤の表裏両面を同時に研磨する方法および装置が記載されている。
【０００３】また、特公昭６１－１０２７５号公報には、一対の回転研磨体のうち一方を回転研磨体の回転軸に対して首振りしないようにし、他方を自在継ぎ手により回転研磨体の回転軸心に対して首振りするようにして、被研磨体の表裏両面を研磨する方法および装置が記載されてい

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【０００４】
【発明が解決しようとする課題】特開平６－２１０５６０号公報に記載されている方法では、回転研磨体の直径が被研磨体の直径より小さいため、また回転研磨体を被研磨円盤の軸心に沿う回転軸心周りに往復運動させて研磨するため、被研磨円盤の場所によって研磨速度の大小が生じ、被研磨円盤の面全体を均一に、かつ高速に研磨加工することが困難であるという課題があった。
【０００５】また特公昭６１－１０２７５号公報に記載されている方法では、回転研磨体の一方を片軸で保持し、他方を自在継ぎ手により回転研磨体を回転軸心に対して首振り機構として被研磨体を研磨しているため、被研磨体にかかる圧力の分布が均一にならない。このため被研磨体への面全体を均一に研磨することが難しいという課題がある。さらに、被研磨体が回転研磨体により追従回転するため、研磨速度が低いという実用上解決すべき課題があった。
【０００６】
【課題を解決するための手段】上記の課題を解決するためになされた本発明の両面研磨方法は、直径Ｄ１の外周と直径Ｄ２の内周とを有する被研磨円盤の表裏両面を、前記被研磨円盤の両面に対向させて設けた一対の回転研磨体で挟み当てつけて同時に研磨する被研磨円盤の両面研磨方法であって、前記被研磨円盤を縦姿勢保持手段により保持し、かつ強制回転させるとともに、前記一対の回転研磨体を、その回転軸心が前記被研磨円盤の回転軸心に平行な回転軸心を有する直径Ｄ（Ｄ＞Ｄ１－Ｄ２）の回転研磨体としたことを特徴とする被研磨円盤の両面研磨方法である。
【０００７】被研磨円盤の強制回転数は、一対の回転研磨体の回転数より大きくすることが、大きい研磨速度で、かつ被研磨円盤の全体にわたって均一な厚みで研磨する上で好ましい。
【０００８】また、一対の回転研磨体の回転軸心は、被研磨円盤の外周の外側に配置することが被研磨円盤の全体にわたって均一な厚みで研磨する上で好ましい。
【０００９】本発明の研磨装置は、直径Ｄ１の外周と直径Ｄ２の内周とを有する被研磨円盤を縦姿勢に保持する手段と、前記被研磨円盤を強制回転する手段と、前記被研磨円盤の両面を挟むように配置され前記被研磨円盤の回転軸心に平行な回転軸心を有する一対の回転研磨体と、前記一対の回転研磨体の少なくとも一方を前記被研磨円盤に当てつける手段と、前記一対の回転研磨体の回転駆動機構とを有する両面研磨装置であって、前記一対の回転研磨体の直径ＤがＤ＞Ｄ１－Ｄ２であり、かつ、それらの回転軸心が前記被研磨円盤の外周の外側に配置されていることを特徴とする。
【００１０】
【発明の実施の形態】以下に本発明の実施の形態を図１～図４に基づいて説明する。図１は、本発明の両面研磨

装置の一実施例の全体図である。本発明の両面研磨装置５０は、架台５と、この架台５の中央部に配置された被研磨円盤１を縦姿勢に保持する縦姿勢保持手段４と、この保持部４の両側に配置された回転研磨体２ａ、２ｂを含む。

【００１１】ローラー３により縦姿勢に保持された被研磨円盤１の両面を挟むように、その回転軸心が被研磨円盤１の回転軸心と平行になるように、架台５の上に一対の回転研磨体２ａ、２ｂが配置されている。

【００１２】回転研磨体２ａは、架台５に固定された軸受体１４ａにより回転可能に支持された回転軸筒体１３ａに固定されている。支持具（図示しない）により固定された電動モータ７ａの回転は、電動モーターの回転軸に取り付けられたプーリー１６ａと、プーリー１６ａと回転軸筒体１３ａの端部に取り付けられたプーリー１５ａをつなぐベルト８ａを介して回転研磨体２ａに伝えられる。回転軸筒体１３ａおよびプーリー１５ａの回転軸内には、貯蔵タンク１８内の研磨液１７を輸送ポンプ９により回転研磨体２ａ内部に供給するための研磨液供給孔６が設けられている。

【００１３】回転研磨体２ｂは、架台５に設けられたレール１０の上を左右方向に滑りながら移動するスライダー部１２に支持された軸受体１４ｂにより回転可能に支持されている回転軸筒体１３ｂに固定されている。電動モーター７ｂの回転は、電動モーターの回転軸に取り付けられたプーリー１６ｂと、プーリー１６ｂと回転軸筒体１３ｂの端部に取り付けられたプーリー１６ｂをつなぐベルト８ｂを介して回転研磨体２ｂに伝えられる。

【００１４】一対の回転研磨体２ａ、２ｂの少なくとも一方を被研磨円盤１に当てつける手段が設けられている。この当てつけ手段は、被研磨円盤１の研磨面に回転研磨体２を所定の圧力で押し当てる機能を有するものであれば特に限定されない。図１においては、軸受体１４を支えるスライダー部１２と、スライダー部１２を左右方向にスライドさせるレール１０と、エアーシリンダーを有する押圧装置１１からなるものが示されている。押圧装置１１のモーター駆動により回転研磨体２ｂは、被研磨円盤１に接近、離間が可能とされ、また適当な圧力で被研磨円盤１に当てつけられる。

【００１５】図１において、回転研磨体２ａは左右方向に固定され、回転研磨体２ｂは左右方向に当てつけ手段により移動可能である。被研磨円盤１は一対の回転されている回転研磨体２により押圧状態で当てつけられ、この押圧状態で研磨液が供給され研削加工、研磨加工が行われる。被研磨円盤１の縦姿勢保持手段４は、被研磨円盤１を少なくとも３個のローラーにより、その外周面が挟まれて保持される。

【００１６】図２は、本発明の両面研磨装置の被研磨円盤１の縦姿勢保持手段４と強制回転用モーター１９の一実施の形態を示す図である。図２（ａ）には、３つの回転自在に取り付けられたローラー３ａ、３ｂ、３ｃと一つの被研磨円盤を強制回転するローラー３ｄにより保持されている状態が示されている。各ローラー３の厚み（紙面に垂直な方向）の寸法は、被研磨円盤１の厚みの寸法より十分に大きい。各ローラー３の外周面には、被研磨円盤１の厚みより若干大きい幅の溝が、被研磨円盤１の保持手段からの取り外し、または保持手段の取り付けを容易にするために設けられてもよい。上側２つのローラー３ａ、３ｃは、横梁４２を長さ方向に沿って滑るようにして移動可能に取り付けられた移動金具４３を介して、支持金具４４により、それぞれのローラーの回転軸心が水平になるように支持されている。下側のローラー３ｂ、３ｄは、支柱４１に取り付けられている。

【００１７】図２（ｂ）には、本発明の被研磨円盤１を強制回転する手段の一実施の形態が示されている。ローラー３ｄの軸は、強制回転用モーター１９に連結され、ローラー３ｄの回転により所定の回転数で強制回転される。被研磨円盤１の強制回転は、少なくとも１つのローラーに取り付けた強制回転用モーターで行われる。

【００１８】図３は、本発明にかかる内周の直径Ｄ２と外周の直径Ｄ１とを有する被研磨円盤１と回転研磨体２の回転軸心の位置関係を説明するための図である。図３には、被研磨円盤１が、その外周面で３つのローラー３ａ、３ｂ、３ｃの外周面に挟まれて縦姿勢に保持された状態が示されている。一方の回転研磨体２ａの回転軸心は、被研磨円盤１の回転軸心に平行に移動でき、距離ａが調整可能なものとすることができ、回転研磨体２ａの直径をＤとしたとき、Ｄ＞Ｄ１－Ｄ２とされる。

【００１９】本発明に用いられる、回転研磨体２は、金属製またはセラミックス製の定盤上に研磨パッドを貼りつけたものや、定盤の表面に所定粒度のダイヤモンド砥石を貼りつけたものを用いることができる。図４（ａ）、図４（ｂ）は、本発明に用いることのできる回転研磨体の一実施例の形態の平面図および断面図である。図４（ａ）では、金属製の円板２０の片面には研磨液供給孔６につながる溝２２が定盤の外周に向かって放射状に設けられている。溝２２は渦巻き状や格子状等としてもよい。

【００２０】定盤面には樹脂製の研磨パッド２１が貼りつけられている。研磨液供給孔６より供給される研磨液（図４（ｂ）の矢印から供給される）では、研磨パッド２１が定盤２０の表面に加工された溝の表面にならうようにして貼りつけられることによりできる溝の上に供給される。研磨パッド２１は、必ずしも定盤の溝２２内面に密着させて貼りつけておく必要はなく、定盤の溝２２と研磨パッド２１の間に隙間がある状態で貼りつけてあってもよい。

【００２１】研磨加工時においては、溝部の研磨パッドの面には加工荷重がかからないために、溝に沿って研磨液が供給されるからである。定盤にダイヤモンド砥石を

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貼りつけて回転研磨体とする場合は、貼りつけるダイヤモンド砥石片を上記のような溝ができるようにするのがよい。

【００２２】本発明の研磨方法の実施に用いられる研磨剤としては、平均砥粒が０．２μｍ～２μｍ程度の酸化セリウム、ダイヤモンド砥粒、炭化ケイ素砥粒、アルミナ砥粒、ジルコニア砥粒、酸化マンガン砥粒、酸化鉄砥粒等を純水またはアルカリ性の液に分散させたものや、平均粒径が０．０２μｍ～０．２μｍ程度のコロイダルシリカを用いることができる。また、ダイヤモンド砥石等の固定砥粒を用いてもよい。

【００２３】本発明の研磨剤を保持する研磨パッドとしては、ウレタン製のスェードのパッド、発泡ウレタン製のパッド、不織布のパッドなどのシート状のものを用いることができる。さらに、機械加工や熱プレスによる溝付きの研磨パッドであってもよい。

【００２４】図１の本発明の両面研磨装置は、回転研磨体２ａ側から研磨液を供給した一実施の形態である。研磨液が供給される側と供給されない側では、被研磨円盤の取代量には差が生じない。被研磨円盤は、磁気記録装置（ＨＤＤ）に用いられる磁気記録媒体用のガラス円盤やアルミニウム円盤が好適に用いられる。

【００２５】以下に本発明を実施例により詳述する。

実施例１

図１に示す両面研磨装置を用いて、外周の直径が６５ｍｍ、内周の直径が２０ｍｍ、厚さ０．６５ｍｍのアルミノシリケートガラスのドーナツ状のガラス円盤について、取代が０．０５～１０μｍの研磨加工を行った。用いた両面研磨装置の仕様および研磨条件は下記の通りである。

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＊【００２６】１）回転研磨体：直径７０ｍｍのステンレス製定盤に、ウレタン製のスエードの研磨パッド（第一レース株式会社製品名シーガル１９００）を貼りつけたもの。

２）定盤：図４に示すように、幅５ｍｍ、深さ０．５ｍｍの断面がＲ形状である溝を６本設けた。

３）研磨液の供給

軸心から溝を経て供給：回転研磨体の一方の回転軸心に設けた研磨液供給孔から、平均粒径が約１μｍの酸化セリウムを純水に分散させたものを、毎分３～１０ｍｌ供給。

４）回転研磨体の回転数：８００ｒｐｍ

５）ガラス円盤の回転数：１０００ｒｐｍ

６）回転研磨体の押圧力：約５ｋｇｆ

７）研磨時間：１分

８）ガラス円盤の回転中心と回転研磨体の回転軸心との距離：２５ｍｍ

９）回転研磨体の回転軸心のガラス円盤外周面からの距離ａ：外側へ１１．５ｍｍ

【００２７】研磨条件と研磨の評価結果を表１にまとめて示す。このときガラス円盤の取代バラツキは、研磨前後のガラス円盤の１２個所について測定を行った。表１の実施例１から、回転研磨体の回転軸心のガラス円盤外周からの距離ａが外側へ１１．５ｍｍのとき、取代７．２μｍの研磨を研磨速度７．２μｍ／ｍｉｎで行うことができた。またこのときのガラス円盤内の取代バラツキは、ガラス円盤内の１２ヶ所を測定したところ０．１μｍ以下であることがわかった。

【００２８】

【表１】

例	研磨条件				研磨の評価	
	ｶﾞﾗｽ円盤	回転研磨体			取代の面内ﾊﾞﾗﾂｷ (μm)	研磨速度 (μm/min)
	外径D1/内径D2 (mm)	強制回転数と回転方向	直径D D-(D1-D2) (mm)	回転軸心のｶﾞﾗｽ円盤外周からの距離a (mm)		
（実施例）						
1	65/20	1000 追従方向	70 25	外側へ 11.5	＜0.1	7.2
2	65/20	500 逆方向	70 25	外側へ 7.5	＜0.1	3.8
3	65/20	1000 逆方向	70 25	外側へ 1.5	＜0.1	5.5

【００２９】実施例２
実施例１とは、ガラス円盤の回転数を回転研磨体に追従回転する方向とは逆向きに５００ｒｐｍとし、回転研磨体の回転軸のガラス円盤外周からの位置ａを外側へ７．５ｍｍに変えた以外は同じようにして、ガラス円盤の研磨を行った。結果を表１に示す。表１の実施例２から回転研磨体の回転軸のガラス円盤外周からの距離ａが外側＊へ７．５ｍｍのとき、取代３．８μｍの研磨を研磨速度３．８μｍ／ｍｉｎで行うことができた。またこのときのガラス円盤内の取代バラツキは、実施例１と同じように測定したところ０．１μｍ以下であることがわかった。

【００３０】
【表２】

例	研磨条件				研磨の評価	
	ｶﾞﾗｽ円盤	回転研磨体			取代の面内ﾊﾞﾗﾂｷ (μm)	研磨速度 (μm/min)
	外径D1/内径D2 (mm)	強制回転数と回転方向	直径D D-(D1-D2) (mm)	回転軸心のｶﾞﾗｽ円盤外周からの距離a (mm)		
比較例						
1	65/20	せず (追従回転)	70 25	外側へ 7.5	0.3	3.0
2	65/20	せず (追従回転)	40 -5	内側へ 7.5	1.0	3.0

【００３１】実施例３
実施例１とは、ガラス円盤の回転数を回転研磨体に追従回転する方向とは逆向きに１０００ｒｐｍとし、回転研磨体の回転軸のガラス板外周からの距離ａを外側へ１．５ｍｍに変えた以外は同じようにして、ガラス円盤の研磨を行った。結果を表１に示す。表１の実施例３から回転研磨体の回転軸のガラス円盤外周からの距離ａが外側※へ１．５ｍｍのとき、取代５．５μｍの研磨を研磨速度５．５μｍ／ｍｉｎで行うことができた。またこのときのガラス円盤内の取代バラツキは、実施例１と同じように測定したところ０．３μｍであった。

【００３２】
【表３】

例	研磨条件				研磨の評価	
	ｶﾞﾗｽ円盤	回転研磨体			取代の面内ﾊﾞﾗﾂｷ (μm)	研磨速度 (μm/min)
	外径D1/内径D2 (mm)	強制回転数と回転方向	直径D D-(D1-D2) (mm)	回転軸心のｶﾞﾗｽ円盤外周からの距離a (mm)		
比較例3						
(イ)	65/20	せず (追従回転)	70 25	外側へ 1.5	0.25	4.5

	9					10
(ロ)	65/20	せず (追従回転)	70 25	外側へ 7.5	0.2	3.0
(ハ)	65/20	せず (追従回転)	70 25	外側へ 11.5	1.0	2.3

【００３３】 ＊ ＊【表４】

例	研磨条件				研磨の評価	
	ガラス円盤		回転研磨体		取代の面内バラツキ (μm)	研磨速度 (μm/min)
	外径D1/内径D2 (mm)	強制回転数と回転方向	直径D D−(D1−D2) (mm)	回転軸心のガラス円盤外周からの距離 a (mm)		
比較例４						
(イ)	65/20	せず (追従回転)	70 25	(追従回転)	0.25	4.5
(ロ)	65/20	せず (追従回転)	70 25	(追従回転) 1.5	0.3	4.0
(ハ)	65/20	せず (追従回転)	70 25	外側へ 11.5	0.5	3.3

【００３４】 ※ ※【表５】

例	研磨条件				研磨の評価	
	ガラス円盤		回転研磨体		取代の面内バラツキ (μm)	研磨速度 (μm/min)
	外径D1/内径D2 (mm)	強制回転数と回転方向	直径D D−(D1−D2) (mm)	回転軸心のガラス円盤外周からの距離 a (mm)		
比較例５						
(イ)	65/20	せず (追従回転)	70 25	内側へ 11.5	0.3	6.3
(ロ)	65/20	せず (追従回転)	70 25	外側へ 7.5	0.3	5.0
(ハ)	65/20	せず (追従回転)	70 25	外側へ 11.5	0.6	4.3

【００３５】比較例１ 50 実施例１とは、ガラス円盤の回転数を回転研磨体の追従

回転によるものとし、かつ回転研磨体の回転軸心のガラス板外周からの距離ａを７．５ｍｍとした以外は同じようにして、ガラス円盤の研磨を行った。表２に結果を示すように、ガラス円盤の面内の取代バラツキは、実施例１と同じように測定したところ、０．３であり、研磨速度は３．０μｍ／ｍｉｎであった。

【００３６】比較例２

実施例１とは、回転研磨体の直径を４０ｍｍとし、その回転軸心のガラス円盤外周からの距離ａを内周側に７．５ｍｍとしたこと、ガラス円盤の回転数を回転研磨体に追従回転させたこと以外は同じようにして、ガラス円盤の研磨を行った。結果を表２に示すように、取代３．０μｍの研磨を３．０μｍ／ｍｉｎで行うことができた。しかし、ガラス円盤の取代バラツキは、実施例１と同じように測定したところ１．０μｍと大きなものであった。

【００３７】比較例３

実施例１とは、ガラス円盤を強制回転せず追従回転としたこと、および回転研磨体の回転軸心のガラス円盤外周からの距離ａを（イ）１．５ｍｍ、（ロ）７．５ｍｍ、（ハ）１１．５ｍｍとしたこと以外は同じにして、ガラス円盤の研磨を行った。結果を表３に示すように、実施例１と比較して研磨速度も低く、ガラス円盤の取代バラツキも大きいものとなった。

【００３８】比較例４

実施例２とは、ガラス円盤を追従回転したこと、回転研磨体の回転軸のガラス板外周からの距離ａを（イ）－１１．５ｍｍ、（ロ）１．５ｍｍ、（ハ）１１．５ｍｍとしたこと以外は同じにして、ガラス円盤の研磨を行った。結果を表４に示すように、ガラス円盤の取代バラツキが大きいものとなった。

【００３９】比較例５

実施例３とは、ガラス円盤を追従回転したこと、および回転研磨体の回転軸のガラス円盤外周からの距離ａを（イ）－１１．５ｍｍ、（ロ）７．５ｍｍ、（ハ）１１．５ｍｍとしたこと以外は同じにして、ガラス円盤の研磨を行った。結果を表５に示すように、ガラス円盤の取代バラツキが大きいものとなった。

【００４０】以上説明したように、実施例と比較例で説明したように、ガラス円盤を強制回転させ、かつ、回転研磨体の回転軸心の位置をガラス円盤の外周より外側に位置させて研磨することにより、大きな研磨速度を維持して、ガラス円盤の研磨取代を全面にわたって均一にすることができることが分かる。

【００４１】また、ガラス円盤の研磨取代を全面にわたって均一に行うには、回転研磨体の半径（研磨有効半径）をガラス円盤の径方向の幅よりも大きくするとよいことがわかった。

【００４２】

【発明の効果】本発明によれば、直径Ｄ１の外周と直径Ｄ２の内周とを有する被研磨円盤の表裏両面を、被研磨円盤の両面に対向させて設けた一対の回転研磨体で挟み当てつけて同時に研磨するに際して、縦姿勢に保持手段した被研磨円盤を強制回転させるとともに、被研磨円盤の回転軸心に平行な回転軸心を有するように配置した一対の回転研磨体の直径Ｄを（Ｄ１－Ｄ２）のより大きくしたので、大きな研磨速度で、被研磨盤全体を均一な厚みに研磨することができる。

【図面の簡単な説明】

【図１】本発明の両面研磨装置の一実施の形態の全体正面図である。

【図２】本発明の被研磨円盤の縦姿勢保持手段と強制回転手段の一実施の形態を説明する正面図である。

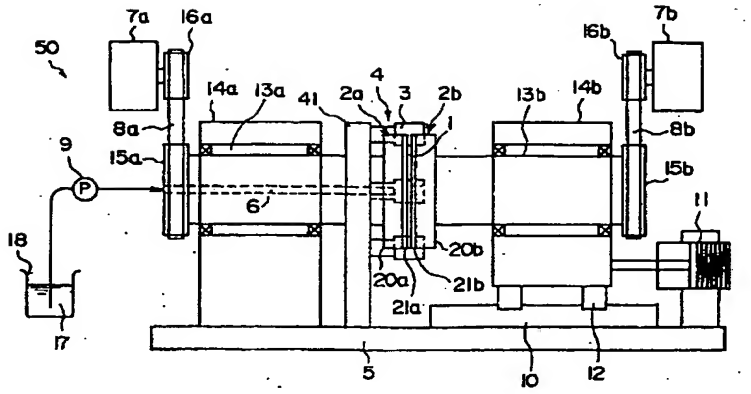
【図３】本発明の研磨方法にかかる被研磨円盤と回転研磨体の位置関係を示す図である。

【図４】本発明の両面研磨装置の回転研磨体の一実施の形態の平面図および断面図である。

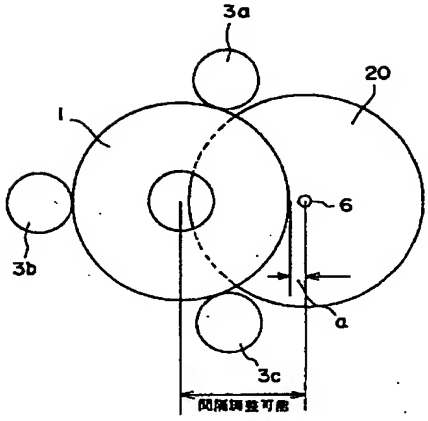
【符号の説明】

１：被研磨円盤
２：回転研磨体
３：ローラー
４：縦姿勢保持手段
５：架台
６：研磨液供給孔
７：電動モーター
８：ベルト
９：輸送ポンプ
１０：レール
１１：押圧装置
１２：スライダー部
１３：回転軸筒体
１４：軸受体
１５、１６：プーリー
１７：研磨液
１８：貯蔵タンク
１９：強制回転用モーター
２０：定盤
２１：研磨パッド
２２：溝
４１：支柱
４２：横梁
４３：移動金具
４４：支持金具
５０：本発明の研磨装置

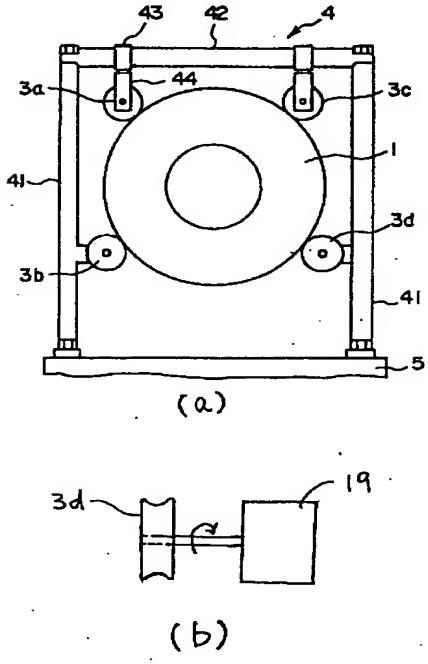
【図１】



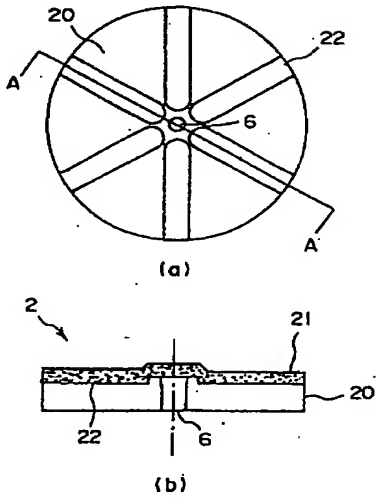
【図３】



【図２】



【図４】



【手続補正書】
【提出日】平成１１年９月２２日（１９９９．９．２２）
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【補正対象書類名】明細書
【補正対象項目名】発明の名称
【補正方法】変更
【補正内容】
【発明の名称】　両面研磨方法および両面研磨装置

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